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Spring 2014

The Circuit, Spring 2014

Department of Electrical and Computer Engineering, Michigan Technological University

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The Circuit

Electrical and Computer Engineering

Spring 2014



INTELLIGENT ROBOTICS

Plotting a Course with UAVs



From the Chair

Dan Fuhrmann, Chair
Department of Electrical and Computer Engineering

Hello to our ECE alumni and friends from Houghton and the vibrant campus of Michigan Tech. The faculty, staff, and students of the ECE department send you their very best wishes along with this latest issue of our alumni newsletter, *The Circuit*.

Our department played a big role in the major technological shifts of the 20th century, and I have been giving a lot of thought lately to how we can continue to be influential and relevant in the 21st. It requires that we look into the crystal ball a little bit, to see where things are headed, but also to think about how we would like the world to look in the future and what we can do to make that happen. I am particularly interested in what I see as the convergence of computing, control, and communication in our engineered systems and the products we use on a daily basis. We are looking at a world where just about every device is equipped with sensors and actuators and connected to a global network. Perhaps you have heard about such changes with the terms *the Internet of Things* or *the 4th Industrial Revolution*. I want Michigan Tech to make its mark in this arena and to prepare students for the jobs of the future. To that end, I have been working to build new bridges between ECE and the

Department of Computer Science and the School of Technology, since the traditional boundaries between these disciplines may all but disappear soon. Stay tuned for future developments on how some of these relationships are being formalized.

In this issue we highlight the activity of one of our new faculty members who is working at the epicenter of the convergence of these technologies. Timothy Havens, an ECE alumnus, holds a joint appointment in ECE and CS and is bringing new excitement to our computer engineering program.

We also look back on the many years of service of Ashok Ambardar, someone who represents the very best of teaching at Tech. Many of you may remember Ambardar and his classes in electric circuits, linear systems, and signal processing.

Last fall we welcomed two new faculty members to the department. Lucia Gauchia comes to us from the University of Carlos III in Madrid and is an expert in energy storage systems. Zhaohui Wang is a recent PhD graduate from the University of Connecticut and brings her expertise in sensor networks and communication systems, with particular application to underwater acoustic networks.

A noticeable change in our faculty over

the past ten years is the number of named professorships. This is consistent with what is happening in many academic departments nationwide, where philanthropic gifts help us attract and retain the best and the brightest. Right now, the department has five faculty members in named positions of one sort or another, and their stories are included here.

With this issue we start a new feature with stories about successful ECE alumni. Bill Jackson and Dave Brule are two names that may be familiar to you. Both have been very generous with their time and their personal resources, not just for the department, but for Michigan Tech at large. We are proud of their accomplishments and happy to claim them as our own.

The ECE department at Michigan Tech continues to change, to grow, and to evolve, but our mission to be an agent for public good through technological progress remains the same. It is great to be a part of it. I hope you feel the same way: you are a part of it, too. Enjoy reading, and stay in touch!

Complete the Circuit: A Call For Alumni Updates

News from here on campus is really only half the story. Our students are why we are here, and hearing their success as alumni reaffirms our dedication to a hands-on, technology-centric education.

Keep us in the loop on what's new in your life and career. Visit www.mtu.edu/ece/department/contact. Let us know how it's been going; while you're there, check out our news blog for the latest activities in ECE.

Thanks for what you do, for representing all of us back here at Tech so well. Every single one of your stories reminds us of the pride we have in our alumni.

On the Cover

Timothy Havens and his research team are blazing a trail for the future of UAVs.

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Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295

Endowed Professorships



Bruce Mork, a professor in the Department of Electrical and Computer Engineering, has been named the Dennis Wiitanen Professor of Electric Power Systems.

The Wiitanen Professorship was established to honor longtime ECE faculty member Dennis Wiitanen, who retired in August 2012. Unlike most professorships, which are named for a single donor, the Wiitanen Professorship is supported by an endowment underwritten by a variety of industry, foundation, and alumni sources, including ITC Holdings, Consumers Energy Foundation, DTE Energy Foundation, and electrical engineering alumnus David Brule.

Mork was named to the position after a yearlong selection process. He received high praise from leaders in the power industry and was unanimously supported by the major sponsors of the professorship.

"Bruce is the natural choice for the Wiitanen Professorship," said Dan Fuhrmann, chair of electrical and computer engineering. "He has been a leader in teaching, research, and curriculum development in the power and energy area within the ECE department and across campus for many years. He is a leading expert in power system protection, an area of critical need in the utility power industry as our infrastructure transitions to the smart grid. Plus, he was the driving force behind our online courses in power and energy, a model for the rest of the department and indeed the rest of the University."

Dennis Wiitanen was also gratified by Mork's appointment.

"I have had the pleasure of watching Bruce grow from a newly minted PhD assistant professor at Michigan Tech to an internationally recognized leader in the power field," he said. "I am very pleased that he will be the first recipient of the professorship carrying my name."

Bruce Mork was honored in his acceptance.

"It's been a privilege to work with Dennis over the last twenty-one years of his outstanding forty-two-year career at Michigan Tech. He's been an exemplary senior colleague and role model for us all. It's an honor for me to be the first recipient of this prestigious professorship. The resources provided will support ongoing developments in education and research which strategically address technology and workforce needs of the electric power sector. We owe a lot to Dennis and this will greatly help us to maintain and advance our strong program."

The professorship has a five-year renewable term and carries with it an annual discretionary stipend to support research equipment, graduate students, and other expenses to build and maintain an active research program in the power area.

Wayne Weaver has been named the Dave House Associate Professor of Electrical Engineering. Weaver is an expert in microgrids, electrical machines, and control of power systems. He collaborates extensively with mechanical engineering faculty, in particular Gordon Parker, who holds the John and Cathi Drake Professorship.

Last June, **Bo Chen** was named the Dave House Associate Professor of Mechanical Engineering and Electrical Engineering. Chen, who formerly held a sole appointment in the ME-EM department, now holds a joint appointment in ME-EM and ECE, with the majority appointment in ME-EM.

Chen received her PhD from the University of California, Davis, in 2005. She conducts interdisciplinary research in mechatronics and embedded systems, agent technology, modeling and control

of hybrid electric vehicles, cyber-physical systems, and automation. The National Science Foundation, Department of Energy, and industrial partners fund her research projects. Chen has authored or co-authored more than seventy peer-reviewed journal and conference papers. She received the Best Paper Award at the 2008 IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications.

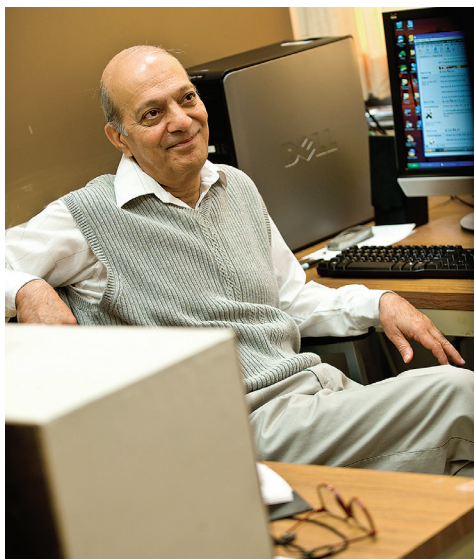
Lucia Gauchia joined the Michigan Tech faculty last fall with a joint appointment in ECE and ME-EM, with the majority appointment in ECE. She has been named the Richard and Elizabeth Henes Assistant Professor of Energy Storage Systems. She is an expert in energy storage systems and state estimation for batteries and supercapacitors.

The awarding of two of these three professorships was the result of a cooperative agreement between the ECE and ME-EM departments, as it involved a kind of swap of endowed positions. Dave House is an ECE alumnus, whereas Richard Henes is a ME-EM alumnus.

"I am delighted that ECE and ME-EM were able to work out this arrangement," Fuhrmann said. "If Michigan Tech is to continue its success in energy systems, electric and hybrid electric vehicles, and control and automation, it's going to require the close cooperation of our two departments."

ME-EM chair Bill Predebon agreed. "I am very excited about the growth in collaboration between the ME-EM and ECE departments," he said. "These joint appointments are a significant step in that direction. Our vision to establish a leadership position in the energy systems area will require continued strong cooperation between our two departments."

Timothy Havens is the William and Gloria Jackson Assistant Professor of Computer Systems. He joined the faculty at Michigan Tech in 2012. See page 6 for more information.



Ashok Ambardar came to Michigan Tech to teach undergraduate electrical engineering in 1976. He grew up in Kashmir, in the foothills of the Himalayas, leaving home at sixteen to go to college.

Q: How did you end up teaching?

A: I'd been thinking about teaching from the time I was a student, but truthfully, I stumbled onto engineering. The mechanical engineering program was full, so my advisor suggested electrical. Then, during my master's program in India, friends had gone abroad and said, "You must come visit and go for a PhD." Before you know it, this job at Michigan Tech came up. I applied, and here I am.

Q: Have you noticed any changes in undergraduate EE students over the past four decades?

A: Math skills are weaker. I've noticed that dilution of the standard high school education. Not that they're not being taught as much. It's that there's a mind-set change, with computers, TV, video games. Students are now more active in other areas, and there's only so much time in a day.

It's more of a challenge to teach today's students, definitely. If you look at how the world is now, those very same people are the ones making advances in the technology we are enjoying. So things are different, but not always necessarily bad. Instead of always coming down hard on the youngsters, we need to realize that the changing nature of technology is affecting them. Kids are growing up and interacting with technology at such a young age.

The technology kids are using now takes away two or three senses at one time—eyes, hands, and ears.

Four Decades of Perspective

I don't know how that bodes for their relationships, when so much communication isn't expressed physically in-person anymore, but through technology. They are using technology, but fewer numbers are pursuing it as a career. They'd much rather play with it than design or develop it.

Q: Do you enjoy teaching?

A: I enjoy every minute of it. I teach Circuit Analysis—it's a tool more than anything. These are problem-solving courses. I lecture with the chalkboard exclusively. That way I know when to strike when it's hot, with the right data and the right approach for the class on that particular day, for those particular students. No two lectures are alike.

Nowadays, many instructors and professors present their lectures using PowerPoint and later post them online for students to access at will. The option then exists for a student to skip class. The best thing about a chalkboard is that you can erase it. Students who aren't present won't have the notes, and then what? If everyone shows up, and more are in the class than not, the discussions are more interesting. Learning moves at the speed of chalk.

I like to look at the group and tailor instruction to their needs. I want to make sure they get the idea and work on it. I don't want them to be afraid of being tested on it.

I feel guilty grading exams. If I had my way, I'd just teach. Let's get it to the point of becoming comfortable, then move on. It seems as though everything in society moves on the numbers—that there's just one sphere of success. But that's not the point of education. The point of education is to become complete human beings. If I can ask questions that make you think, and show you several ways of attempting to answer a question, then it's been worthwhile.

Q: What is the most meaningful experience you've had as a professor?

A: I've had several students over the years who, after receiving a grade of F, came back to retake the course, and earned an A.

Q: Has class size changed?

A: When you are doing graduate-level teaching, you have a small group of students. You bring in your interests, such as journal articles, to offer different perspectives. It's a less-structured format.

By force of the number of students, undergraduate education must be structured. Class sizes range from twenty to one hundred. If I were a student, I'd think it was nice to be in a smaller class, but then you must be up to speed!

Q: What concerns you the most?

A: The pace at which technology moves means more for kids to learn, and there's only so much time to learn it. Nowadays, electrical engineers are being urged to specialize early because of this rapid pace.

Q: What excites you the most about the changes you have seen in technology over the past thirty-seven-plus years?

A: These are exciting times for technology. It is bringing people together, especially those in rural areas and in the developing world where there is no electricity or running water. Farmers will be able to get crucial information on growing crops, for instance. The potential benefits are so great.

Q: What is your advice to a young undergraduate engineering student? How can he or she be successful?

A: Look to what you are really interested in and see where that takes you. Don't be afraid to look at the world around you, ask questions, and be curious. If you want to feel good about what you are doing as a profession—working for its own sake, as opposed to simply putting food on the table and a roof over your head—then you need education.

Young people are much more idealistic than us adults. It's good to have them looking out for others, creating a revolution.

• • • • •

Ambardar received the Distinguished Teaching Award in 1983 and 1999 and was the Eta Kappa Nu Professor of the Year in 1981, 1983, 1987, and 2006. During his tenure at Tech, he has taught more than 120 EE courses and thousands of students. He has also authored three textbooks; the latest is *Digital Signal Processing—A Modern Introduction*, 2nd Edition.

"Ashok Ambardar is a teaching legend," says Dan Fuhrmann, ECE chair. "The overwhelmingly positive response from students over the years proves that you don't need a lot of bells and whistles to be an excellent teacher—just clear, thoughtful, well-prepared explanations of technical concepts, and compassion for students."

ECE: Sparking an Interest in STEM Careers



The ECE department has been very active in reaching out to area youth through on-campus workshops, student and faculty visits to local schools, and hosting lab sessions each year for Engineering Scholars and Women in Engineering explorations from Summer Youth Programs.

The heart rate monitor workshop was created by ECE's Blue Marble Security Enterprise with the goal of designing a simple circuit that could be easily soldered together for use in outreach programs to spark interest in science and engineering. The circuit board is capable of detecting the pulse in someone's finger and then flashing an LED with each heartbeat.

Recently, Blue Marble partnered with the Houghton Middle School Science and Engineering Explorations class to bring a group of middle school students to Michigan Tech and construct their own circuit boards. The workshop included a tour of the ECE labs and the projects in construction by our Senior Design and Enterprise groups. Throughout the experience, the students learned how to solder, got some basic information on how circuits work, and used what they learned to create electronic displays of their heartbeats.

Two middle school workshops were held in the fall and a third was held on campus this spring.

Makers and Models: The Coming 3D Revolution

Joshua Pearce, associate professor in ECE and materials science and engineering, is not one for understatement. "This is the beginning of a true revolution in the sciences," says the author of *Open-Source Lab*. For cash-strapped researchers, he could be right.

His new book is a step-by-step DIY guide for making lab equipment. The essential tools are a 3D printer, open-source software, and free digital designs. "It's a guidebook for new faculty members setting up labs," he said. "With it, they can cut the cost by a factor of 10—or even 100—for research-grade equipment. Even in the classroom, we can do a \$15,000 educational lab for \$500."

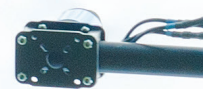
Pearce began printing lab equipment in earnest after a seminal moment, when he priced a lab jack at \$1,000. "All it does is move things up and down," he said. Using a printer and open-source software, his team made a utilitarian replica for about five dollars.

Saving money is just the half of it. "This lets faculty have total control over their laboratory," he said. Because designs are fluid, "devices can evolve with your lab rather than become obsolete."

But for Pearce, perhaps the best thing about open-source 3D printing is the open-source part. Makers, as 3D printer aficionados are called, not only use designs posted on the Internet; they also post their own and provide feedback. And *Open-Source Lab* is written for a wide audience, from novices to those who are "at one with the force of open source," who can skip the introductory material and get right to work printing their own equipment.

"You can share your ideas and get help from the community, and it speeds things up so much," he said. "It's like having a global R&D team dedicated to your work."





INTELLIGENT ROBOTICS

Michigan Tech alumnus Timothy Havens returns to his alma mater and brings with him his insight into the latest advances in intelligent robotics.

Unmanned aerial vehicles (UAVs, commonly called drones) are all over the news, from conflict overseas to future plans for delivering parcels. ECE's Intelligent Robotics Laboratory—directed by Tim Havens—is aiming high in this field by giving a bird's-eye view to bridge inspectors and keeping soldiers safe from the threat of explosive hazards. Havens joined Michigan Tech in Fall 2012 as the William and Gloria Jackson Assistant Professor of Computer Systems and holds a joint appointment in the Departments of Electrical and Computer Engineering and Computer Science.

After receiving his BS and MS in Electrical Engineering from Michigan Tech in 1999 and 2000, Havens then spent five years at MIT Lincoln Laboratory working on simulation and modeling of directed energy systems and global positioning systems (GPS). He went on to receive his PhD in Electrical and Computer Engineering from the University of Missouri in 2010. Prior to joining Tech, he was a National Science Foundation (NSF)/Computing Research Association (CRA) Computing Innovation Fellow at Michigan State University, where he developed machine learning methods for heterogeneous and big data.

"It is a dream-come-true to return to Michigan Tech and give back to the program that gave me so much," he says. "I didn't fully realize it at the time, but my education here was top-notch. At Lincoln Labs I was able to compete on the same playing field as graduates from programs like MIT and Illinois. This was a real eye-opener for how good my Tech education was."

Funding for UAV research comes from the Michigan Department of Transportation (MDOT) and a Michigan

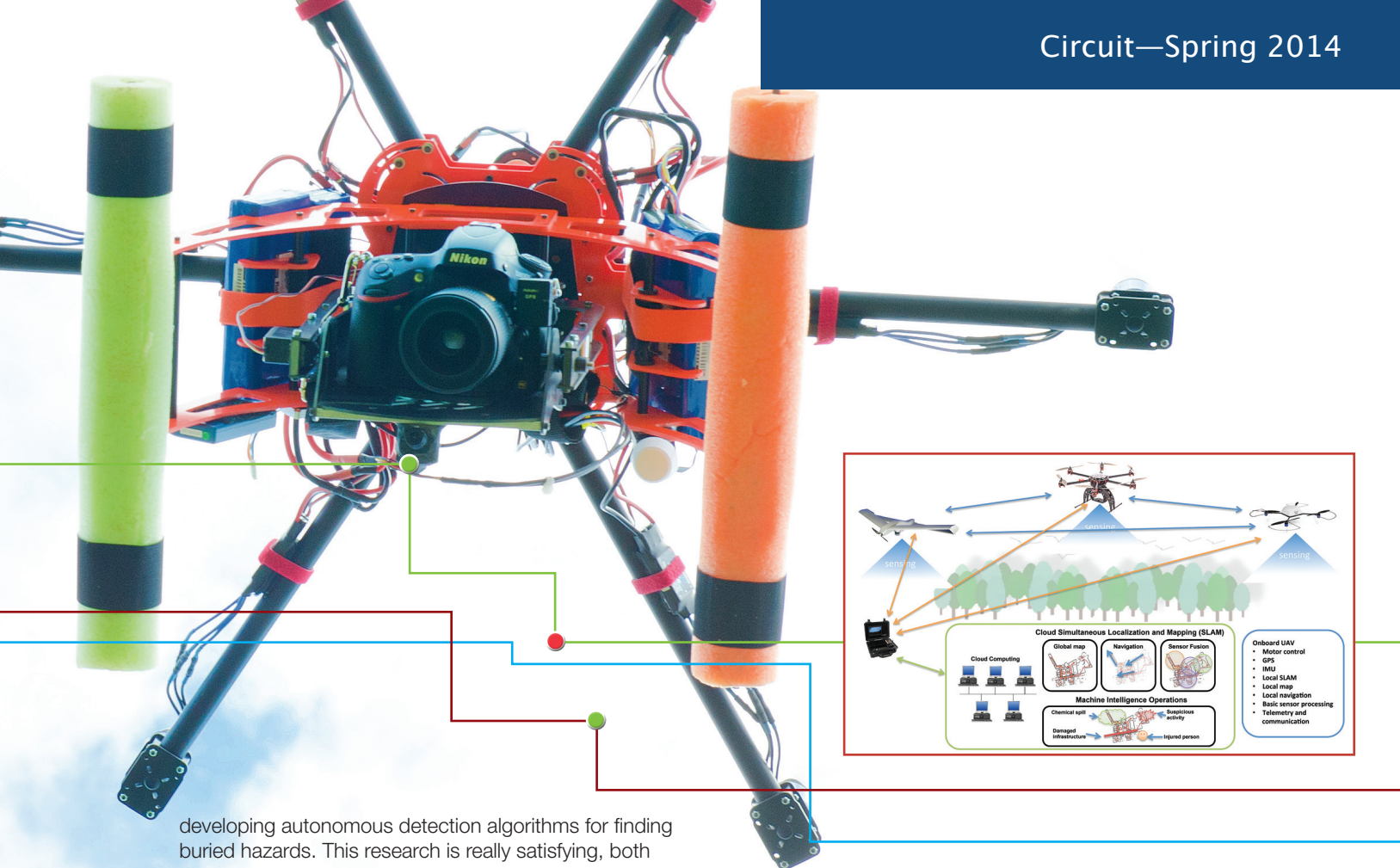
Tech Research Excellence Fund award. "UAVs have recently attracted both good and bad media attention," says Havens. "While drone hunting licenses, as proposed in a small town in Colorado, may make a catchy headline, the real story is that micro aerial vehicles are going to revolutionize industries in both commercial and public sectors. Photographers now have the capability to shoot from the air without renting time on an expensive helicopter, and they can get into locations that a helicopter simply cannot. But it doesn't stop there. We plan to look at how UAVs can be used to track plumes from power plants, measure the composition of ash clouds from volcanoes, and inspect all kinds of infrastructure."

The lab is also researching how UAVs can be made autonomous: choosing paths, avoiding obstacles, and deciding how to best achieve assigned goals.

"We are really pushing the envelope, discovering how groups of autonomous UAVs can work together to provide better information than a single UAV," says Havens. "This is made possible by major advances in electronics miniaturization, battery technology, and micro-computing hardware. Our drones carry multiple miniature computers, which are a thousand times faster than the desktop computer I had in high school. They can also communicate with our supercomputer here on campus, sharing information and processing it in real-time. It is really exciting stuff."

Havens is also working on two projects funded by the US Army involving the detection of buried explosives with ground-penetrating radar and other sensors.

"The idea is to use sensors, allowing soldiers to stay far away from hazards," he says. "The farther away a hazard is, the tougher it is to detect. We are integrating machine learning and signal processing to build an end-to-end solution for creating high-quality radar images and



developing autonomous detection algorithms for finding buried hazards. This research is really satisfying, both technically and personally; it is motivating to think that the better we do, the more lives this technology could save.”

The Intelligent Robotics Laboratory (IRL) is also made up of exceptional undergraduate and graduate students working under the direction of Havens. “I had expectations that my students were going to be good,” he said. “But I have been blown away by how great the students are that I get to work with. They are creative and smart, and there is a real drive in the undergraduates to get involved with research, a vital part of their experience.”

“Working in the IRL has shown me applications for everything I’ve been working on in school,” explains third-year ECE student Josh Manela. “Undergraduate research has also given me a preview into what the graduate life of engineering is like and has influenced my graduate school decision.”

The IRL is also key to the research experience for Havens’s graduate students. “Robotics is a really interesting subject; what I enjoy about working in this group is the environment,” says EE PhD student Hanieh Deliamsalehy. “The whole research group is smart and nice, and I learn something new almost every day! We read a lot of news about UAVs being used for different applications, from delivering essential supplies to finding problems along railroads. In a world that goes more and more toward automation, nobody can deny that what we’re working on is already a real-world problem.”

“In the next ten years, robotics is going to be a major area of interest for everyone,” explains MSEE student Pranav Bhatkhande. “Beyond military applications, we’re looking at robots that will deliver packages, get pizza, and save lives in dangerous environments. It would also be great if we could have them take out the trash.”

“Robotics has always been a field of interest,” says Anuj Potnis, MSEE student. “This project gives me the opportunity to work on the latest technology regarding micro controllers, sensors, and implement algorithms. My research is aimed at developing a vision-based system to be mounted on a UAV for the 3D reconstruction of the area it surveys. I am working on the problem of pose estimation of the camera in 3D space. The results are expected to supplement the outputs of other traditionally used measurement devices like GPS, accelerometers, and gyroscopes, and provide a robust estimate of the camera position.”

Havens’s research work has earned him the best paper award at FUZZ-IEEE 2012, the IEEE Franklin V. Taylor Memorial Award for best paper at IEEE SMC 2011, and the best journal paper award from the Midwest Nursing Research Society in 2009. He has published more than fifty technical articles. Havens is a senior member of the IEEE and is an associate editor of the *IEEE Transactions on Fuzzy Systems*.

“Tim is the quintessential teacher-scholar,” notes ECE chair Dan Fuhrmann. “He is building a cutting-edge research program that attracts the attention of funding agencies and is getting students excited. At the same time, he is capable of bringing that excitement into the classroom. He has taught our sophomore-level course in digital logic and a graduate-level course in computational intelligence, and received fantastic student evaluations in both. We’re lucky to have him.”



Alumni Spotlight



David J. Brule

BS Electrical Engineering, 1972

Service is in the nature of David J. Brule, Sr, president and CEO of Northern Star Industries in Iron Mountain. He has served with Friends of Handicapped People, the Interlochen Arts Academy Presidents Council, the Dickinson-Area Catholic School Board, and the Iron Mountain-Kingsford Rotary Club. Additionally, he has served on the board of directors of the First National Bank of Iron Mountain and as director of the UP Construction Labor-Management Council.

Brule earned a bachelor's degree in electrical engineering from Michigan Tech in 1972. He began his career while still at Tech in 1971 as a division engineer with Wisconsin Public Service in Green Bay. He joined M. J. Electric in 1973 as a project

engineer, working up to his appointment as president and CEO in 1991. He continued as president of the company after it was acquired by Exelon Infrastructure Services in 2000. He was inducted into the ECE Academy in 1996.

Recently, Brule made a major contribution to support the Dennis Wiitanen Professorship in Electric Power Systems. This professorship, currently held by Bruce A. Mork, was established to underline the importance of power systems, a passion Mork shares. Brule is also a former member of the Board of Control and recently generously donated to create the John Rovano Plaza outside the Van Pelt and Opie Library.



William Jackson

BS Electrical Engineering, 1958

William Jackson has given much back to Michigan Tech. He and his late wife, Gloria, endowed the William and Gloria Jackson Assistant Professor of Computer Systems, currently held by Timothy Havens.

A native of Laurium, Jackson owned and operated NWR Electronics in Marquette from 1958 to 1980. In 1971, Jackson founded CableAmerica, a cable telecommunications operation. The firm grew rapidly thanks to a commitment to customer service and technical proficiency.

He was inducted into the Arizona Cable Telecommunications Pioneer Hall of Fame in 1998, and to the ECE Academy in 2000. He received the University's Board of Control Silver Medal in the same year.

The Jacksons have established an endowed scholarship for undergraduate students majoring in electrical engineering, with preference given to graduates of Calumet High School, which provided Jackson, who remembers his roots, with a start in life that he continues to value.

Jackson's generosity has also transformed the learning experience for students across campus through the William G. Jackson Center for Teaching and Learning. The center brings together a full suite of technological tools to augment teaching and learning.

Ford Motor Company Donates 2012 Focus All-Electric Vehicle



Ford Motor Company has donated a 2012 Focus all-electric vehicle to the Department of Electrical and Computer Engineering. The department is supplying the vehicle to the Hybrid Electric Vehicle Enterprise, providing students with the opportunity to experience and work on state-of-the-art electric vehicle technology.

The Focus is Ford's first full-production, all-electric passenger vehicle. Its electric powertrain uses a 23 kilowatt-hour, liquid-cooled lithium-ion battery pack, which delivers a range of 76 miles before recharging.

Birgit Sorgenfrei, a Michigan Tech ECE alumna and global

material cost manager of powertrain installations at Ford, presented the vehicle to Tech in a ceremony last September in front of the Dow Environmental Sciences and Engineering Building.

"We are tremendously grateful to Ford for this donation, and I am excited about the continuing relationship between Ford and Michigan Tech that it represents," said Dan Fuhrmann, chair of the ECE department. "It says a lot about the value that companies like Ford see in what our graduates bring to the workforce. It also says a lot about the changing, and increasing, role that electrical and computer engineering will play in

the automobiles of tomorrow."

Associate Professor John Lukowski (ECE), co-advisor of the Hybrid Electric Vehicle Enterprise, spoke with Sorgenfrei while she was visiting campus two summers ago. She asked Lukowski how Ford could help support Michigan Tech's programs. "I asked for assistance in building a cutting edge 'sandbox' for my 'kids' in the Hybrid Electric Vehicle Enterprise and the Automotive Computing Enterprise to play in," he said. "The donation of a 2012 Ford Focus Battery Electric Vehicle is the culmination of a shared-vision initiative, providing a platform to excite and expose students to emerging and rapidly evolving technologies.

"Many institutions of higher learning feature programs that include extensive modeling and simulation of vehicle components, subsystems, as well as overall vehicle performance," Lukowski went on to say. "But only the best have a physical laboratory where the computational results can be validated. The Focus will be our rolling laboratory. The vehicle will provide the environment where students can instrument, measure, test, wrench, tinker, and tweak to modify and optimize performance

as guided by their modeling and simulation. This provides the practical, hands-on experiences facilitated by strong faculty-industry partnerships that make our programs unique and truly world class."

Michigan Tech and Ford Motor Company have had a partnership dating back at least to 1954. Ford Motor Company and the Ford Motor Company Fund have supported a wide range of activities across campus, including scholarships, capital projects, Senior Design and Enterprise programs, student organizations, sponsored research, advisory board membership, recruiting support, youth programs, and diversity initiatives.

"Ford is proud of its long-standing relationship with Michigan Tech and supports the school's commitment to developing the next generation of electrification engineers," said Gil Portalatin, Ford global electrified programs engineering program manager. "We are pleased to donate the Ford Focus Electric to the school to help further the educational experience of its students."

Wireless Communication Enterprise

When the company HGST wanted a new apparatus to test the hot swapping of their hard drives, they had to assemble one in their spare time. It worked, but it needed more features—and there was no more spare time. That's when Andrew Sitter, BSEE '06, thought back to his time in the Wireless Communication Enterprise and contracted them to add those features to the apparatus. Two teams of students were involved, selecting a microcontroller, designing the circuit board, and developing software. These are some of the core capabilities students in WCE possess and have brought to other companies during internships, co-ops, and their careers.

Students have also been working to create audio feedback for athletes using Concept 2 rowing machines; testing software and developing applications for Kyocera Document Solutions; creating an automated timing system for the Michigan Tech athletics department; performing technical research on the usage of balises in European and Asian rail networks; installing a wind turbine to power a student study area through a grant from DTE; and developing smartphone applications for in-car control of Chrysler vehicles.

The Enterprise's fifty students, who come from several different majors, are gaining mastery of a wide range of skills. From the newest technologies, like low-energy Bluetooth, to classic circuit boards, and from smartphone development to designing a solar array and storage system for a school in the Dominican Republic, WCE has grown beyond its roots in wireless systems to prepare students in all ECE disciplines.



Faculty Awards



**Christopher (Kit)
Cischke, Senior Lecturer**
Professor of the Year, Eta Kappa Nu

ECE Faculty Awards and Recognition: January 1–December 31, 2013

**Bo Chen, Dave House Associate Professor
of Mechanical Engineering and
Electrical Engineering**

Best Survey Paper,
IEEE Transactions on Intelligent Transportation Systems

Zhuo Feng, Assistant Professor

Best Paper, 2013 ACM/IEEE Design Automation Conference

Ashok Goel, Associate Professor

Selected to serve as a collection editor for a series of books—*Electronic Circuits and Semiconductor Devices*—to be published by Momentum Press, New York

Shiyan Hu, Assistant Professor

National Science Foundation Faculty Early Career Development (CAREER) Award

John Lukowski, Associate Professor

Finalist, Michigan Tech Distinguished Teaching Award

**Bruce Mork, Wiitanen Professor
in Electric Power Systems**

Michigan Tech Academy of Teaching Excellence

Michael Roggemann, Professor

Featured on AccuWeather.com for his research on the Paulding Light mystery. www.accuweather.com/en/weather-news/spook-or-science-paulding-lights/19414639

Elena Semouchkina, Associate Professor

CBS Detroit, Technology Report named Semouchkina's research on invisibility cloaking one of its top tech news stories of March 2013.

New Faculty

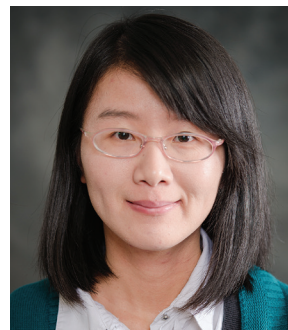


**Lucia Gauchia,
PhD**

Lucia Gauchia joins the ECE department as assistant professor. She comes to Michigan Tech from McMaster University, where she was a postdoctoral research associate and Canada Excellence Research Chair in the hybrid powertrain program.

Gauchia received her PhD and her MSc in Electrical, Electronic and Automation Engineering from University of Carlos III of Madrid, as well as a B.Eng. in Industrial Engineering from the same university.

Gauchia has been published in *IEEE Transactions on Advanced Packaging and Components*; *IEEE Transactions on Industrial Electronics*; *Energy Conversion and Management*; and *Journal of Power Sources*. She has conducted research in smart cell projects, electric traction innovation and development, and design and development of prototype airport cargo vehicles.



**Zhaohui Wang,
PhD**

Zhaohui Wang joins the ECE department as assistant professor. She comes to Michigan Tech from the University of Connecticut.

Wang received her PhD in Electrical and Computer Engineering from the University of Connecticut, as well as an MSc in Signal and Information Processing from the Graduate University of the Chinese Academy of Sciences and a BSc in Electronic Information Science and Technology from Beijing University of Chemical Technology.

Wang's expertise is in wireless communications and signal processing, particularly in the underwater acoustic environment; wireless networking and network security; and cyber-physical systems, particularly cyber-aquatic systems. She has spent many years conducting real-data processing for underwater acoustic communications, networking, and target detection. She has published in *IEEE Communications Magazine*, *IEEE Journal of Oceanic Engineering*, and *IEEE Transactions on Signal Processing*.

2013 Highlights



SPIE/OSA—2013 Activities

During the past year, the SPIE/OSA chapter at Michigan Tech worked to create and promote interest in science, technology, and engineering related to optics/photonics through student designed projects and activities. One of our main missions is to increase optics/photonics awareness in both college and high school. For this, we organized a holography workshop for Michigan Tech's Summer Youth Program and conducted several visits to local high schools. For college students, we held several events on campus including Winter Carnival Florescence, Photonics in Engineering Exploration, and Optics Day. Another part of our mission is to have the Tech optics/photonics program recognized by both the academy and industry. To this end, we hosted a talk by Eustace Dereniak, former president of SPIE.

We organized our first photograph contest around the theme of Frozen Optics. The Photonics Learning Center continued to help students with optics/photonics related courses. Journal club met at least once a month to discuss papers from different areas in optics/photonics to broaden the knowledge of members while having social activities. In addition, last year we started to design and build an LED cube for an optics demo at the entrance of the EERC. Like us on Facebook: [on.fb.me/1glKoLT](https://www.facebook.com/on.fb.me/1glKoLT).



Eta Kappa Nu (HKN)—2013 Activities

Eta Kappa Nu is a unique organization dedicated to encouraging and recognizing excellence in electrical and computer engineering. Here at Michigan Tech, members of the HKN Beta Gamma chapter are dedicated to serving the ECE student body by providing resources and services to help students succeed.

ECE Showcase

HKN helped to organize the ECE Departmental Showcase, an event sponsored for the Spring 2013 Career Fair where company representatives could learn more about the department. Speakers included Chair Dan Fuhrmann, several ECE faculty, and students from various ECE-related organizations and enterprises. The event was in response to the high demand for electrical and computer engineering internships, co-ops, and full-time positions in industry.

Concentrations in ECE Presentations

HKN made presentations on ECE department areas of study to lower-division students. This event helps first- and second-year students home in on their favorite part of electrical and/or computer engineering in order to better direct their course work and careers.

ECE Women's Center

The ECE department has established a Women's Center to create a more inviting and supportive environment for women in electrical and computer engineering. The center, located in 734 EERC, includes networked computers, a soldering station, and high-quality testing equipment, including an oscilloscope, multimeters, and power supplies. HKN is assisting in fundraising efforts for the continued support and development of the center. Current needs include a printer, presentation equipment, meeting table and chairs, and additional lab equipment.

HKN Beta Gamma relies on corporate sponsorship to continue outreach activities and to maintain membership. As such, most of our activities provide unique opportunities for industry sponsors to interact and develop a relationship with current ECE students and the department.

Student Awards

The following ECE student awards were given during the 2013 calendar year.

April 2013

ECE Departmental Scholar:
Adam Funkenbusch, BSEE, BSECP

ECE Woman of Promise:
Rachel Swaney, BSECP

Carl S. Schjonberg Award for Outstanding ECE Undergraduate Student:
Andrew Hoekstra, BSEE, BSECP

Jonathan Bara Award for Outstanding Graduate Teaching Assistant:
Jennifer Winikus, PhD candidate in Computer Engineering

September 2013

Matt Wolfe Award for Outstanding Graduate Research Assistant:
Himanshu Bahirat, PhD EE

Details regarding the students and awards are located on the ECE website at
www.mtu.edu/ece/department/student-awards.

Annual ECE Student–Faculty Hockey Game



After an entertaining three periods of hockey, experience proved no match for youth at the annual ECE student–faculty hockey game December 14. With a final score of students 15, faculty/staff 9, the students were awarded the notorious Maxwell Cup.

“The students had speed and skill on their side, but the faculty had age and wit,” said faculty captain Jeff Burl after the game. “Alas, this was not enough this year.” The students’ first line, made up of a group from Minnesota, was very productive as center Shane Clifford scored a hat trick. The star of the faculty team was Guy “the Waterbug” Hembroff. His teammates agreed that Guy is so good, he can even assist the oldest player on the ice in scoring. The student goalie, Kyle Hashman, played so well he was recruited to the faculty for the second and third periods—after the students jumped out to a 9-0 lead. Jack Hicks had the only penalty of the game, a two-minute minor for tripping. Jack said he was “skating along, and the faculty member just fell down.”